DATA SHEET

For a complete data sheet, please also download:

- The IC06 74HC/HCT/HCU/HCMOS Logic Family Specifications
- The IC06 74HC/HCT/HCU/HCMOS Logic Package Information
- The IC06 74HC/HCT/HCU/HCMOS Logic Package Outlines

74HC/HCT237

3-to-8 line decoder/demultiplexer with address latches

Product specification
File under Integrated Circuits, IC06

December 1990

Philips Semiconductors

PHILIPS

3-to-8 line decoder/demultiplexer with address latches

74HC/HCT237

FEATURES

- Combines 3-to-8 decoder with 3-bit latch
- Multiple input enable for easy expansion or independent controls
- Active HIGH mutually exclusive outputs
- Output capability: standard
- I_{CC} category: MSI

GENERAL DESCRIPTION

The 74HC/HCT237 are high-speed Si-gate CMOS devices and are pin compatible with low power Schottky TTL (LSTTL). They are specified in compliance with JEDEC standard no. 7A.

The 74HC/HCT237 are 3-to-8 line decoder/demultiplexers with latches at the three address inputs (A_n). The "237" essentially combines the 3-to-8 decoder function with a 3-bit storage latch. When the latch is enabled ($\overline{LE}$ = LOW), the "237" acts as a 3-to-8 active LOW decoder. When the latch enable ($\overline{LE}$) goes from LOW-to-HIGH, the last data present at the inputs before this transition, is stored in the latches. Further address changes are ignored as long as $\overline{LE}$ remains HIGH.

The output enable input ($\overline{E}_1$ and E_2) controls the state of the outputs independent of the address inputs or latch operation. All outputs are HIGH unless $\overline{E}_1$ is LOW and E_2 is HIGH.

The "237" is ideally suited for implementing non-overlapping decoders in 3-state systems and strobed (stored address) applications in bus oriented systems.

QUICK REFERENCE DATA

GND = 0 V; T_{amb} = 25 °C; $t_r = t_f$ = 6 ns

SYMBOL	PARAMETER	CONDITIONS	TYPICAL		UNIT
			HC	HCT	
t_{PHL} / t_{PLH}	propagation delay	C_L = 15 pF; V_{CC} = 5 V			
	A_n to Y_n		16	19	ns
	$\overline{LE}$ to Y_n		19	21	ns
	$\overline{E}_1$ to Y_n		14	17	ns
	E_2 to Y_n		14	17	ns
C_I	input capacitance		3.5	3.5	pF
C_{PD}	power dissipation capacitance per package	notes 1 and 2	60	63	pF

Notes

1. C_{PD} is used to determine the dynamic power dissipation (P_D in µW):

   $P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o)$ where:

   f_i = input frequency in MHz

   f_o = output frequency in MHz

   $\sum (C_L \times V_{CC}^2 \times f_o)$ = sum of outputs

   C_L = output load capacitance in pF

   V_{CC} = supply voltage in V

2. For HC the condition is V_I = GND to V_{CC}
   For HCT the condition is V_I = GND to V_{CC} – 1.5 V

ORDERING INFORMATION

See *"74HC/HCT/HCU/HCMOS Logic Package Information"*.

PIN DESCRIPTION

PIN NO.	SYMBOL	NAME AND FUNCTION
1, 2, 3	A_0 to A_2	data inputs
4	$\overline{LE}$	latch enable input (active LOW)
5	$\overline{E}_1$	data enable input (active LOW)
6	E_2	data enable input (active HIGH)
8	GND	ground (0 V)
15, 14, 13, 12, 11, 10, 9, 7	Y_0 to Y_7	multiplexer outputs
16	V_{CC}	positive supply voltage

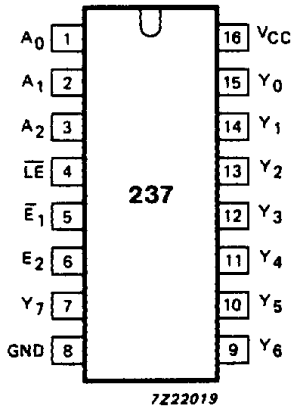


Fig.1 Pin configuration.

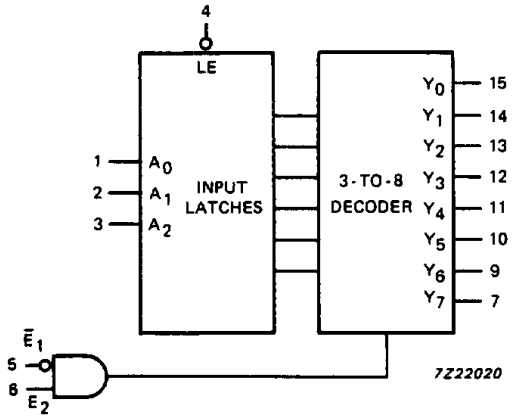


Fig.2 Logic symbol.

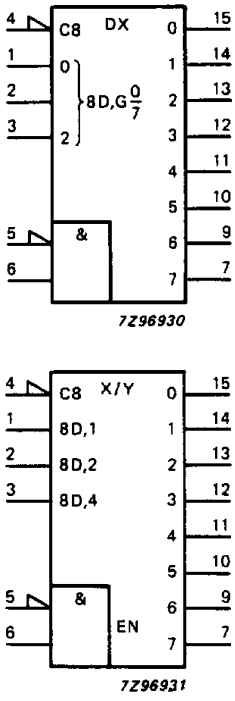


Fig.3 IEC logic symbol.

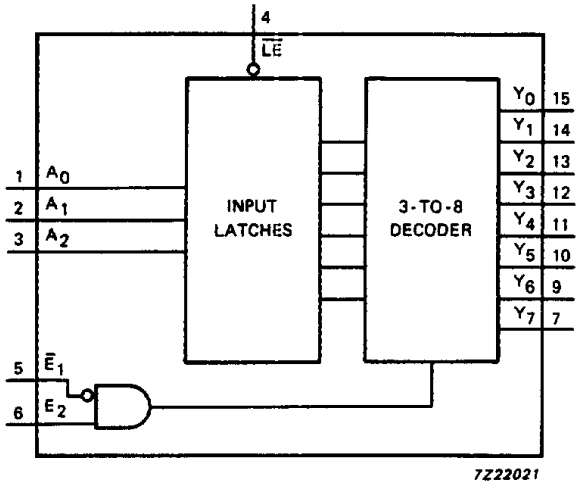


Fig.4 Functional diagram.

FUNCTION TABLE

INPUTS						OUTPUTS							
$\overline{LE}$	$\overline{E}_1$	E_2	A_0	A_1	A_2	Y_0	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7
H	L	H	X	X	X	stable							
X	H	X	X	X	X	L	L	L	L	L	L	L	L
X	X	L	X	X	X	L	L	L	L	L	L	L	L
L	L	H	L	L	L	H	L	L	L	L	L	L	L
L	L	H	H	L	L	L	H	L	L	L	L	L	L
L	L	H	L	H	L	L	L	H	L	L	L	L	L
L	L	H	H	H	L	L	L	L	H	L	L	L	L
L	L	H	L	L	H	L	L	L	L	H	L	L	L
L	L	H	H	L	H	L	L	L	L	L	H	L	L
L	L	H	L	H	H	L	L	L	L	L	L	H	L
L	L	H	H	H	H	L	L	L	L	L	L	L	H

Notes

1. H = HIGH voltage level
   L = LOW voltage level
   X = don't care

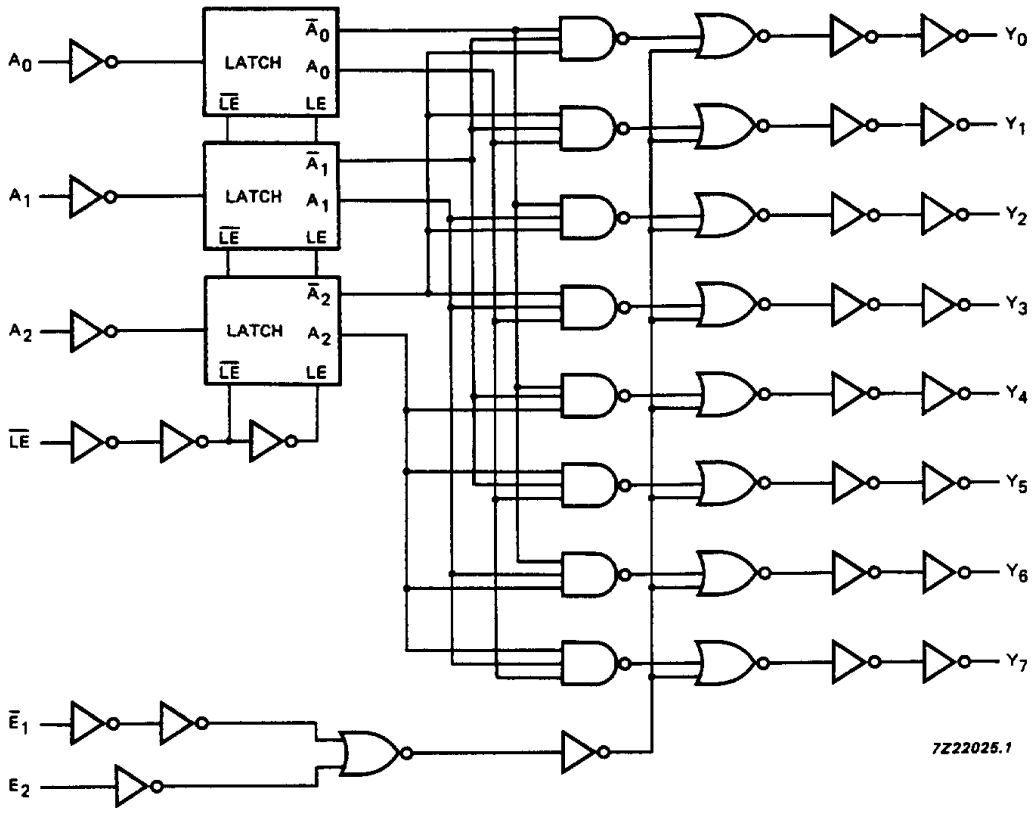


Fig.5 Logic diagram.

DC CHARACTERISTICS FOR 74HC

For the DC characteristics see *"74HC/HCT/HCU/HCMOS Logic Family Specifications"*.

Output capability: standard
I_{CC} category: MSI

AC CHARACTERISTICS FOR 74HC

GND = 0 V; $t_r = t_f$ = 6 ns; C_L = 50 pF

SYMBOL	PARAMETER	T_{amb} (°C)							UNIT	TEST CONDITIONS	
		74HC								V_{CC} (V)	WAVEFORMS
		+25			−40 to +85		−40 to +125				
		min.	typ.	max.	min.	max.	min.	max.			
t_{PHL}/ t_{PLH}	propagation delay A_n to Y_n		52 19 15	160 32 27		200 40 34		240 48 41	ns	2.0 4.5 6.0	Fig.6
t_{PHL}/ t_{PLH}	propagation delay $\overline{LE}$ to Y_n		61 22 18	190 38 32		240 48 41		285 57 48	ns	2.0 4.5 6.0	Fig.7
t_{PHL}/ t_{PLH}	propagation delay $\overline{E}_1$ to Y_n		47 17 14	145 29 25		180 36 31		220 44 38	ns	2.0 4.5 6.0	Fig.7
t_{PHL}/ t_{PLH}	propagation delay E_2 to Y_n		47 17 14	145 29 25		180 36 31		220 44 38	ns	2.0 4.5 6.0	Fig.6
t_{THL}/ t_{TLH}	output transition time		19 7 6	75 15 13		95 19 16		110 22 19	ns	2.0 4.5 6.0	Fig.6
t_W	$\overline{LE}$ pulse width LOW	50 10 9	11 4 3		65 13 11		75 15 13		ns	2.0 4.5 6.0	Fig.8
t_{su}	set-up time A_n to $\overline{LE}$	50 10 9	6 2 2		65 13 11		75 15 13		ns	2.0 4.5 6.0	Fig.8
t_h	hold time A_n to $\overline{LE}$	30 6 5	3 1 1		40 8 7		45 9 8		ns	2.0 4.5 6.0	Fig.8

DC CHARACTERISTICS FOR 74HCT

For the DC characteristics see *"74HC/HCT/HCU/HCMOS Logic Family Specifications"*.

Output capability: standard
I_{CC} category: MSI

Note to HCT types

The value of additional quiescent supply current (ΔI_{CC}) for a unit load of 1 is given in the family specifications. To determine ΔI_{CC} per input, multiply this value by the unit load coefficient shown in the table below.

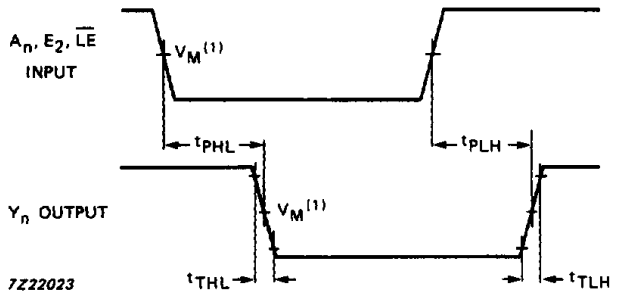
INPUT	UNIT LOAD COEFFICIENT
A_n	1.50
$\overline{E}_1$	1.50
E_2	1.50
$\overline{LE}$	1.50

AC CHARACTERISTICS FOR 74HCT

GND = 0 V; $t_r = t_f$ = 6 ns; C_L = 50 pF

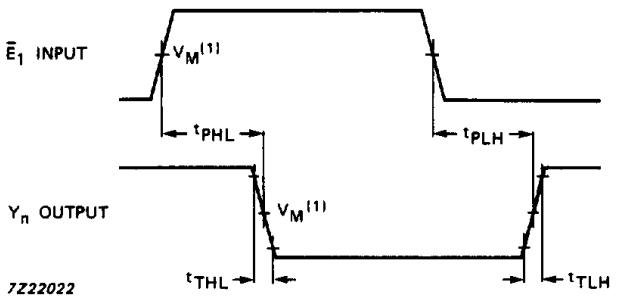
SYMBOL	PARAMETER	T_{amb} (°C)							UNIT	TEST CONDITIONS	
		74HCT								V_{CC} (V)	WAVEFORMS
		+25			−40 to +85		−40 to +125				
		min.	typ.	max.	min.	max.	min.	max.			
t_{PHL}/ t_{PLH}	propagation delay A_n to Y_n		22	38		48		57	ns	4.5	Fig.6
t_{PHL}/ t_{PLH}	propagation delay $\overline{LE}$ to Y_n		25	42		53		63	ns	4.5	Fig.7
t_{PHL}/ t_{PLH}	propagation delay $\overline{E}_1$ to Y_n		20	35		44		53	ns	4.5	Fig.7
t_{PHL}/ t_{PLH}	propagation delay E_2 to Y_n		20	33		41		50	ns	4.5	Fig.6
t_{THL}/ t_{TLH}	output transition time		7	15		19		22	ns	4.5	Fig.6
t_W	$\overline{LE}$ pulse width HIGH	10	5		13		15		ns	4.5	Fig.8
t_{su}	set-up time A_n to $\overline{LE}$	10	2		13		15		ns	4.5	Fig.8
t_h	hold time A_n to $\overline{LE}$	5	0		5		5		ns	4.5	Fig.8

AC WAVEFORMS



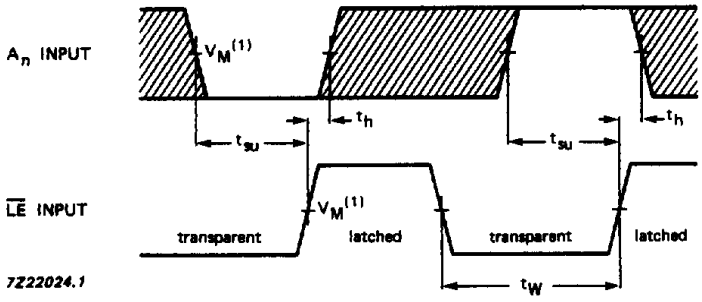
(1) HC : V_M = 50%; V_I = GND to V_{CC} .
HCT: V_M = 1.3 V; V_I = GND to 3 V.

Fig.6 Waveforms showing the address input (A_n) and enable inputs (E_2, $\overline{LE}$) to output (Y_n) propagation delays and the output transition times.



(1) HC : V_M = 50%; V_I = GND to V_{CC} .
HCT: V_M = 1.3 V; V_I = GND to 3 V.

Fig.7 Waveforms showing the enable input ($\overline{E}_1$) to output (Y_n) propagation delays and the output transition times.



The shaded areas indicate when the input is permitted to change for predictable output performance.

(1) HC : V_M = 50%; V_I = GND to V_{CC} .
HCT: V_M = 1.3 V; V_I = GND to 3 V.

Fig.8 Waveforms showing the data set-up, hold times for A_n input to $\overline{LE}$ input and the latch enable pulse width.

APPLICATION INFORMATION

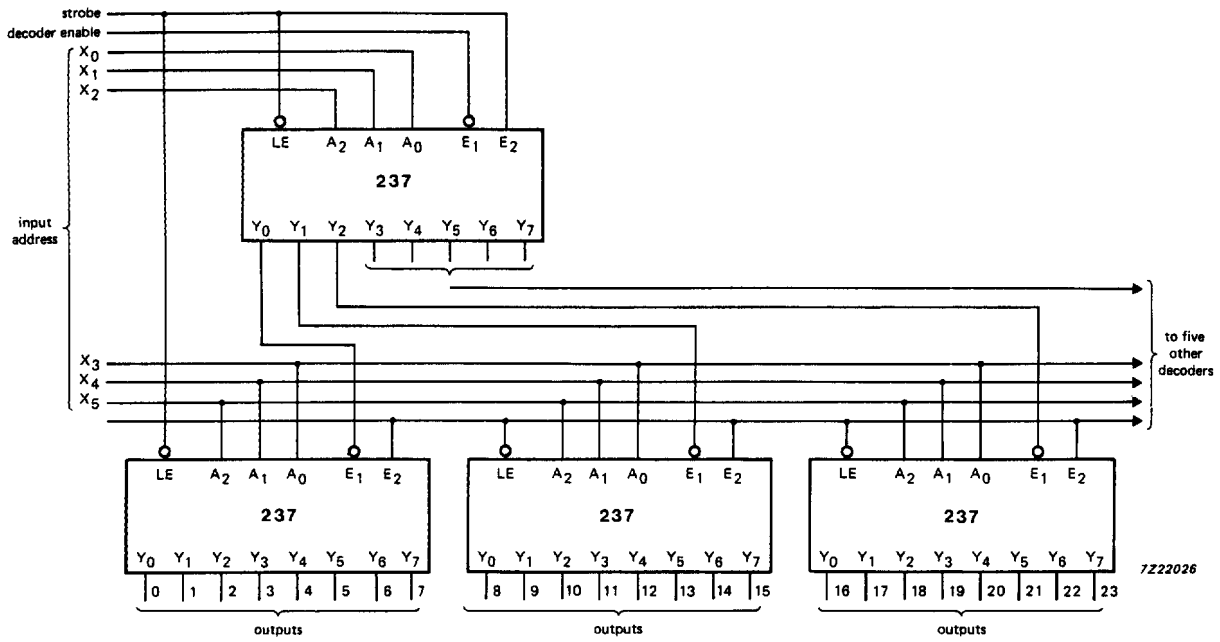


Fig.9 6-to-64 line decoder with input address storage.

PACKAGE OUTLINES

See *"74HC/HCT/HCU/HCMOS Logic Package Outlines"*.